مجلة الغري للعلوم الاقتصادية والادارية
مجلد (21) عدد (2) 2025

A Comparative Study in Methods of Estimating Cointegration Regressin with Practical Application

assistant teacher
Ali Mohammed Ali
University of Misan, Faculty Management and Economics
Alialfredawy1970@yahoo.com

Abstract

Providing a clear picture of the nature and content of the research, this study pioneered the fundamental concepts of time-dynamic minute analysis, variance analysis, unit root probability, integration tests, and technical methods for estimating plasma model parameters.

Based on this foundation, the research focused on testing the stability of time-dependent strains, confirming the existence of co-integration between these strains, and then comparing the following methods and estimations:

1- Ordinary Copy Method (OLS).
2- Fully Ordinary Copy Method (FMOLS).
3- Ordinary and Systematic Copy Method (DOLS).
4- Canonical Integral Covariance Estimator (CCR).

These concepts were applied in the practical aspect using the Eviews 7 statistical software.

The results we obtained were as follows:

The general term for the prices of electronic laptops is statistically influenced by a specific factor. This means that the monetary factor is important in determining the overall Consumer Price Index. This can be explained by the fact that an increase in the volume of transactions will lead to an increase in investment in the purchase of various services. To meet this demand, a large amount of circulating cash is available to stimulate the Iraqi economy. The ratio between domestic and foreign authorities in terms of ranges is statistically significant, indicating an important financial model in the Japanese economy, A regression model was applied to integrate signals and an error correction model for the two research phenomena: the general index of smartphone prices in Iraq, and local tracking via instant internet.

Keywords: *Time series analysis, cointegration, integrative regression models*

مجلة الغري للعلوم الاقتصادية والادارية
مجلد (21) عدد (2) 2025

دراسة مقارنة في طرق تقدير انحدار التكامل المشترك مع تطبيق عملي

المدرس المساعد علي محمد علي
جامعة ميسان، كلية الإدارة والاقتصاد
Alialfredawy1970@yahoo.com

المستخلص

لتقديم صورة واضحة عن طبيعة البحث ومحتوياته، كانت مقدمة عن المفاهيم الأساسية لتحليل السلاسل الزمنية، وانحدار التكامل المشترك، وأهم اختبارات جذر الوحدة، واختبارات التكامل المشترك، والأساليب الإحصائية لتقدير معلمات نموذج الانحدار.

انطلاقًا من هذا الأساس، ركز هذا البحث على تشخيص واختبار استقرار السلاسل الزمنية، واختبار وجود تكامل مشترك بين هذه السلاسل، ثم مقارنة طرق التقدير التالية:

1- طريقة المربعات الصغرى العادية (.OLS)

2- طريقة المربعات الصغرى العادية المعدلة بالكامل (.FMOLS)

3- طريقة المربعات الصغرى العادية الديناميكية (.DOLS)

4- مُقدِّر الانحدار التكاملي الكنسي (.CCR)

تم تطبيق هذه الأساليب في الجانب التطبيقي باستخدام برنامج Eviews.7 الإحصائي.

وقد كانت النتائج التي توصلنا اليها كالاتي:-

العلاقة بين المؤشر العام لأسعار المستهلك وعرض النقود من حيث النطاق إيجابية وضعيفة إحصائيًا. وهذا يعني أن النقد عامل مهم في تحديد المؤشر العام لأسعار المستهلك. ويمكن تفسير ذلك بأن زيادة كمية النقد المتداول ستؤدي إلى زيادة الإنفاق على شراء مختلف السلع والخدمات. ولتلبية هذا الطلب، أدى ارتفاع كمية النقد المتداول إلى انتعاش الاقتصاد العراقي.

2- العلاقة بين الناتج المحلي الإجمالي وعرض النقود من حيث النطاق إيجابية وذات دلالة إحصائية، مما يعني أن عرض النقود عنصر مهم في الاقتصاد الياباني.

3- تم توضيح العلاقة قصيرة الأجل وطويلة الأجل من خلال تطبيق نموذج الانحدار للتكامل المشترك ونموذج تصحيح الخطأ لظاهرتي البحث: المؤشر العام لأسعار المستهلك وعرض النقود في العراق، والناتج المحلي الإجمالي وعرض النقود.

الكلمات المفتاحية: *تحليل السلاسل الزمنية، التكامل المشترك، نماذج الانحدار التكاملي*

مجلة الغري للعلوم الاقتصادية والادارية
مجلد (21) عدد (2) 2025

1-1 introduction

The planning process is one of the most important reasons for the development of nations. Good planning is based on scientific methods, especially statistical ones. Among these statistical methods which study the relationship between variables is the decline of common integration.

In many cases, economic theory provides a long-term relationship between two or more variables. Even if these variables depart from their equilibrium values in the near term, there are forces that return them to these values and ensure that this relationship is achieved in the long term. Examples are many: the relationship between income and consumption, public expenditure and income tax, the relationship between prices and wages, the relationship between money supply and price levels ..... and so on.

If we want to clarify this relationship in the long term, the problem we face is that most of the time series are unstable but integrated in the first order (8). In these circumstances, the search for the relationship in the long term using unstable time series does not preclude the risk of obtaining misleading results.

It is true that the differences allow for the stability of these time series, but in this case we lose all information related to the behavior of these variables in the long term.

So the question arises: can we clarify the long-term relationship between two or more variables? The answer to this question is that we can not explain the state in which the variables are integrated from the class (n).

The relationship in the long term between these variables only if they have a relationship of common integration and this means that there are two variables or more have a long-term balance relationship, and as is known, the model and statistical theory is not important without tests and estimates.

In the regression model of co-integration after ensuring the stability of the time series, the integration between these sequences is confirmed by tests (shown in one part of this thesis) under the zero hypothesis that "there is no common integration between the variables" To find efficient capabilities with reliable and good characteristics.

On this basis, the focus of this thesis was on the stage of diagnosing and testing the stability of time series and testing the existence of a common integration between these chains and then comparing the following estimation methods:

1-Ordinary Least Square (OLS).

2-Fully Modified Ordinary Least Square (FMOLS).

3-Dynamic Ordinary Least Square (DOLS).

4-Canonical Cointegrating Regression Estimator (CCR).

And then employ these methods in the applied side Eviews.7 using the statistical program. After that

In order to provide a clear picture of the nature of the message and its contents, it has been divided into four chapters. The first chapter contains an introduction to

مجلة الغري للعلوم الاقتصادية والادارية
مجلد (21) عدد (2) 2025

the decline of joint integration with a review of the most important researches and studies that dealt with the analysis of the decline of common integration in general, The second chapter included the basic concepts of time series analysis, the regression of joint integration, the most important tests of the root of the unit, the tests of joint integration, and the statistical methods for estimating regression model parameters

The third chapter contains the practical aspect, and the fourth and final chapter contains the most important conclusions and recommendations derived from this letter.

1-2 goal

The research aims to use the methods modern standard represented in the style of regression joint integration in the study of the relationship in the long term and then make a comparison between the number of estimation methods (method of least squares normal, the least squares method completely modified, the least squares method of dynamic, way downhill joint integration of the True) By studying the model of the relationship between the general index of consumer prices, which is one of the indicators of inflation and money supply in Iraq, as well as the relationship between the supply of money and GDP in Japan to show the existence of balance in the long term Long among them

the theoretical side

Some basic definitions and concepts in time series analysis-:

1.2 Time Series

The time series is a set of views ranked chronologically are recorded in times of time consecutive certain phenomenon are two types of time series of intermittent Discrete Time Series continuous time series Continuous Time Series, but the time series most frequently used in the applied field is the discrete time series that are the length of time between the watch and other These can be obtained either by recording the values of the phenomenon at fixed times or by collecting the values of the phenomenon for a fixed period of time.

If we of the previous observations of the time series to predict accurately about the future behavior of the phenomenon represented by the time series, we call it a series of time non-random non stochastic time series, but if we were able to identify the potential structure of the future behavior of the phenomenon only is called in this case the chain random time stochastic time series .

1. Dickey-fuller test.

The researchers Dickie and Foller presented this test in 1979. This test assumes that the error is not related. This test can be illustrated by the following equation:

$$\Delta Y_t = b_1 + (p-1)Y_{t-1} + u_t \ldots(16).$$

Under the Hypothesis:

H0: (ρ -1) = 0

H1: (ρ -1) <0

مجلة الغري للعلوم الاقتصادية والادارية
مجلد (21) عدد (2) 2025

If ρ is significant and less than one, we accept the alternative hypothesis that there is no root unit, ie, the variable is stable.

2. Augmented Dickey_Fuller test.(ADF).

The ADF is based on the root of the unit mainly on:

1- Estimating the following models:

Model I: (without fixed limit and time trend) (52)

$$\Delta Y_t = (p-1)Y_{t-1} + \sum_{j=1}^{k} p_j \Delta Y_{t-1} + \xi_t \ldots(17)$$

Model II: (without chronological direction) (52) •

$$\Delta Y_t = a + (p-1)Y_{t-1} + \sum_{j=1}^{k} p_j \Delta Y_{t-1} + \xi_t \ldots.(18)$$

Model III: (with fixed limit and time trend) (24) •

$$\Delta Y_t = a + \beta T + (p-1)Y_{t-1} + \sum_{j=1}^{k} p_j \Delta Y_{t-1} + \xi_t \ldots.(19)$$

Representing: α constant limit, T time trend and calculated as follows:

T = (t-1- ((1/2) N), (t = 2, 3, ... N)

K represents the duration of the greatest slowdown, which can be determined by the following formula:

Kmax = int {12 (N / 100) ¼}

Sample size: N

Moral level: α

<u>This test (ADF) includes the following stages:</u>

<u>Phase 1: The following steps include:</u>

1- Estimation of Model III

$$\Delta Y_t = a + \beta T + (p-1)Y_{t-1} + \sum_{j=1}^{k} p_j \Delta Y_{t-1} + \xi_t$$

2-Test the null hypothesis (H0: ρ = 1), which states that the model is not stable against the alternative hypothesis (H1: ρ <1), which provides for the stability of the model. Using the statistical laboratory ADFtp as follows:

$$ADF_{tp} = (\hat{p}-1)/SE_{\hat{P}}$$

The statistical rule states that when the calculated value of the statistical laboratory is less than the critical value, we reject the null hypothesis (H0) and accept the alternative hypothesis (H1). If it is rejected (H0: ρ = 1) we can infer that the model is stationary(stable), otherwise we proceed to the next step (3).

مجلة الغري للعلوم الاقتصادية والادارية
مجلد (21) عدد (2) 2025

3 - Test the null hypothesis that β = 0 Note that ρ = 1, against the alternative hypothesis that states β ≠ 0 Note that ρ = 1, which can be written as follows:
H0: (α, β, ρ) = (α, 0, 1)
H1: (α, β, ρ) = (α, β, 1)
Using the statistical laboratory $ADF\Phi 3$, which can be calculated according to the following formula:
$\Phi 3$ = {(RSSr - RSSur) / 2} / {RSSur / N-J-3}
Since, RSSr: the sum of the portlets of the restricted model.
RSSur: The sum of the portlets of the unrestricted model.
And compare them with the critical value $ADF\Phi 3$. If H0 is rejected, we move on to the next step, otherwise we move on to the second stage, which includes the estimation and testing of Model II.
4. Test the null hypothesis (H0: ρ = 1) using normal distribution if H0
Rejected statistically, we can infer that the model III is stable and does not suffer from mono-root, otherwise we infer the presence of the mono-root. In this case it is necessary to recalculate and test the model III but in the form of Differences (Differences) first class and then the second degree ... and so on
Phase II: It includes the following steps:
1. Estimation of model II:

$$\Delta Y_t = a + (p-1)Y_{t-1} + \sum_{j=1}^{k} p_j \Delta Y_{t-1} + \xi_t$$

2. Test H0: ρ = 1 H1:P<1
Using the statistical laboratory ADFtρ as in the second step of the first stage and comparing the value calculated with the critical value, rejecting the null hypothesis H0 then we show that the model is stable and otherwise we move on to the next step.
3 - test the null hypothesis that states α = 0 Note that ρ = 1 against the alternative hypothesis that states α ≠ 0 Note that ρ = 1, which can be written as follows:
H0: (α, ρ) = (0, 1)
H1: (α, ρ) = (α, 1)
Using the statistical laboratory ADF11, which is calculated according to the following formula:
$\Phi 1$ = {(RSSr-RSSur) / 2} / {RSSur / N-J-2}
And compare them with the critical value of $ADF\Phi 1$. If the null hypothesis is rejected, we move on to the next step. Otherwise, we proceed to the third phase of the tests, which include the estimation and testing of model I.
4- Test (H0: ρ = 1) using the normal distribution. If H0 is statistically rejected, then we can infer the stability of the data according to model II. Otherwise, we can infer that the time series data is not stable. In this case, According to model II but in the form of differences starting with the first class (d = 1) and the second class (d = 2)

مجلة الغري للعلوم الاقتصادية والادارية
مجلد (21) عدد (2) 2025

And so on .

Phase III: It includes the following steps:

1. Estimation of model I:

$$\Delta Y_t = (p-1)Y_{t-1} + \sum_{j=1}^{k} p_j \Delta Y_{t-j} + \xi_t$$

2- Test H0: ρ = 1 H1:P<1

Using the statistical laboratory ADFtρ as in the steps described above and comparing the calculated value with the critical value and when rejecting the null hypothesis H0 can be inferred from the stability of the data according to the model I, otherwise we indicate the lack of stability of the data and their suffering from the mono root in this case must be

Re-apply the previous stages and all stages and different variances until we get to the stable state of time series data study and then we say that the data are integrated from the class d and wrote as:-

Yt ~ I (d).

2.2 Co-integration regression

When estimating a regression relationship between a number of variables in an unstable time series image, it is possible that the estimated regression relationship between them is a false relationship, although some indicators such as R^2 and t values

Calculated due to the fact that the change in these variables may be due to another variable that affects all of them, which makes their changes concomitant or in other words the relationship may be a relationship of association or association and not a causal relationship. Although one of the solutions to the non-stability of the series is to take the difference, but the regression of the variables in the form of differences for each one is not the solution required as this procedure may lead to loss of long-term characteristics, and as a result have emerged models with long-term characteristics and that these models are stable and The variables in the original were unstable and this is the beginning of the idea of joint integration.

It can be said that joint integration refers to the way to obtain a balance or long-term relationship between unstable variables or it means that there is an adjustment method that prevents error in a long-term relationship from being increased.

The idea of joint integration between two time series, Yt, Xt, is that if the two series are complementary of the same class (d)

Xt ~ I (d)

Yt ~ I (d)

There is a linear relationship between these two variables as follows:

$$Y_t = a_0 + a_1 X_t + U_t$$

In this case, there is a common integration between Yt and Xt of class (d, b) and it is written:

مجلة الغري للعلوم الاقتصادية والادارية
مجلد (21) عدد (2) 2025

Yt ~ CI (d, b), Xt

The function $Y_t = a_0 + a_1 X_t + U_t$ is called the integrator regression gradient.

The idea can be spread to more than two variables. In this case, the condition of equal strings in integration may not apply, but requires that the degree of integration of the dependent variable does not exceed the degree of integration of any independent variables.

1 - Test Engel - Granger Approach [11, 54, 75]

One of the most important tests of joint integration is the Engle and Granger (1987) test, which carries the same steps as the Dicky Fuller test and the Expanded Dicky Fuller test.

If we have the following relationship:

$$Y_t = a_0 + a_1 X_t + U_t$$

The first step is to evaluate this function in the method of the OLS to obtain the residuals:

$$\hat{U}_t = Y_t - \hat{a}_0 - \hat{a}_1 X_t$$

In the second step, the stability of the estimated residuals using the modified DCI model is tested as follows:

$$\Delta \hat{U}_t = \lambda \hat{U}_{t-1} + \sum_{i-1}^{k} p_i \, \Delta \hat{U}_{t-1} \zeta t \ldots (25)$$

To conduct the following test:

H0: $\lambda = 0$

H1: $\lambda < 0$

By comparing the calculated t of the regression with the corresponding t-table values in the specially defined Angel and Granger tables, since the dicele fulleurs are not good for use when testing the error limit stability. So if the values calculated are larger than the tabular, then the null hypothesis is rejected, which means u_t is a stable string and therefore both Xt and Yt are integrated

3.2 Methods for estimating the regression of joint integration.

After making sure that the time series of the variables of the study model are integrated, the next step is to obtain capabilities with good characteristics, and for any assessment of the common integration we must distinguish three elements:

1. Our prior knowledge should be used with respect to the existence of a root unit and the bias of the intermediary should be eliminated if possible and thus this will eliminate the asymmetric part and the disturbing reliability of the parameters and increase efficiency.

2-side multivariate.

3 - sufficient flexibility to contain the dynamics of the system.

مجلة الغري للعلوم الاقتصادية والادارية
مجلد (21) عدد (2) 2025

4.2 Characteristics of the regression capabilities of common integration

The use of the simulation method and the comparison between the methods of estimating the regression of joint integration is the focus of researchers in this field to know the best and most efficient way of estimating the parameters. The differentiation between the methods depends on the formulation of the simulation model, where many possible situations can be assumed in practice Achieve the fundamental objective of finding the best methods for estimating the model of the regression of co-integration by clarifying how estimation methods will affect the following:

1. Change in sample size The size sample intervals
2 - change in the parameters of the distribution parameters Parameters value intervals
3. Change in the number of time periods Total number of Time intervals N

In 1992, Jesus Gonzalo compared a number of estimation methods (Ordinary Least Square, Non Linear An Error Correction Model, Principle Components, Canonical Cointegrating regression, Maximum Likelihood in a Fully Specified Error Correction

The following model was used:

$$y_t - \beta x_t = z_t$$

$$z_t = pz_{t-1} + e_{zt}$$

$$\begin{pmatrix} e_{zt} \\ e_{wt} \end{pmatrix} \equiv iidN \left[\begin{pmatrix} 0 \\ 0 \end{pmatrix} . \begin{pmatrix} 1 & \theta\sigma \\ \theta\sigma & \theta\sigma^2 \end{pmatrix} \right] \quad \begin{matrix} w_t = a_1 y_t - a_2 x_t \\ w_t = w_{t-1} - e_{wt} \end{matrix}$$

After repeating the experiment for 180 times and using Monte Carlo simulation, the following values were used:

a1 = (0, 1)
a2 = -1
p = (0.9, 0.8, 0.5)
σ = (0.25, 0.33, 0.5, 1, 2)
θ = (- 0.5, 0, 0.5)

These methods were compared using statistical measures (mean, median, standard deviation). In the light of the results, the greatest potential was found to be the best of the previous methods.

In another study in 1995, Jose G. Montalvo compared a number of estimation methods (OLS, CCR, DOLS, and Monte Carlo simulation). The following equations were generated:

مجلة الغري للعلوم الاقتصادية والادارية
مجلد (21) عدد (2) 2025

$$y_{1t} = \mu + \beta_0 y_{2t} + \beta_1 y_{2,t-1} + a_1 y_{1\ -1} + u_1$$
$$y_{2t} = y_{2,t-1} + u_1$$
$$u_{1t} = p_{11}\pi_{1t}$$
$$u_{2t} = p_{21}\pi_{1t} + p_{22}\pi_{2t} + p_{23}\pi_{1,t-1}$$

π_1, π_2 Variables distributed by IID N

β_0 = (1, 0.6, 0.2, 0.4, 0.1)

β_1 _1 = (0, 0.4, 0.2, 0.1)

a_1 = (0, 0.4, 0.8)

The results showed that the CCR method performed better than OLS for all results, and that the DOLS method had the least bias in the median and less MSE compared to other capabilities.

In another study in 2008, researchers Kazuhiko Hayakawa and Eiji Kurozumi assumed that regression model errors were generated from the AR regression model with a parameter approaching the correct one at 1 / T as T is the sample size. Under this hypothesis, For the three estimation methods, the lower squares method, the lower squares method

DOLS, CCR) have been shown to have the same goal distribution

$$D(\hat{\theta}_E - \theta \to (\int_0^1 W_2(r)W_2'(r)d_r)^{-1} \int_0^1 W_2(r)dW_{1.2}(r)$$
$$\hat{\theta}_E = \hat{\theta}_{FMOLS} = \hat{\theta}_{CCR} = \hat{\theta}_{DOLS}$$
$$W_{1.2} = W_{11} - W_{12}\Omega_{22}^{-1}W_{21}$$

1.3 Introduction

Monetary policy is one of the basic policies in achieving economic stability in any country in the world and the nature of the use of this policy varies from country to country, and its objectives vary according to the circumstances of each country.

There are many purposes of monetary policy (policies, special policies) that vary according to the economies of countries. Some countries are directing their monetary policy to tackle inflation, and thus stabilize prices. Some of them are oriented towards stabilizing financial markets, stability of exchange markets, and other objectives such as achieving economic growth, achieving high levels of employment, etc.

مجلة الغري للعلوم الاقتصادية والادارية
مجلد (21) عدد (2) 2025

The objectives of monetary policy may sometimes overlap, and sometimes contradict, and this requires coordination among them in order to achieve macroeconomic goals and economic development.

2.3 Money supply concept

Definition of Money Supply .

Cash offer means the sum of the means of payment traded in the community within a certain period of time, ie it includes all means of payment available in circulation and held by individuals, projects and various institutions. The concept of money supply has been widely debated among economists on giving it a specific and agreed concept as well as on the appropriate mechanism to calculate it. Money supply includes two kinds of money: legal money and deposit money. It should be noted here that the money supply is considered a debt on the banking system or the entity that handles the issuance process, as it is an obligation for it and the right of its owners to fully dispose of the amounts in their possession.

The money supply is divided into several types:

1.2.3 The Narrow definition of money (m1)

It means the currency traded outside the banking system in addition to the money deposits or bank money (current deposits). This means that money supply can be expressed in the following equation:

M1 = DD + C

As:

M1 = Money supply in the narrow sense

DD = Current Deposits

C = Currency traded outside of the Cash Money banking system

It is clear from the above that there are two parties that determine the M1 money supply, namely the Central Bank and commercial banks.

2-2-3- Broader measure of money (M2)

Which is a broader concept of money supply than the previous concept M1, which includes non-current deposits as well as current deposits and currency traded outside the banking system, ie includes money supply in the narrow sense M1 plus non-current deposits (quasi money) such as savings deposits.

The broad meaning of cash supply can be expressed in the following equation:

M2 = M1 + TD As:

M2 = Money supply in the broad sense

مجلة الغري للعلوم الاقتصادية والادارية
مجلد (21) عدد (2) 2025

Table 1
Annual values of the money supply and consumer price index

MONEY SUPPLT M1 MTD	consumer PRICES CPI/M/D	years	MONEY SUPPLT M1 MTD	consumer PRICES CPI/M/D	years
705084	2672.9	2003	2650.2	1.597	1988
960503	2242.1	2004	3645.5	1.911	1989
1038097	2759.2	2005	4980.7	2.168	1990
1351876	3166.7	2006	5527.4	2.431	1991
1483836	3565	2007	5499.9	2.623	1992
1728006	3742.5	2008	5777	2.735	1993
2159089	4355.3	2009	6736.6	2.768	1994
3013601	5196.6	2010	8316.7	3.156	1995
2898189	6943.5	2011	9848	3.829	1996
10148626	8815.6	2012	11868.2	4.071	1997
11399125	12073.8	2013	15359.3	6.1736	1998
15460060	18500.8	2014	24670	17.7	1999
21721167	24205.5	2015	43909	32.5	2000
28189934	24851.3	2016	86430	100	2001
37300030	24155.1	2017	238901	548.5	2002

TD = Time Deposit
Source: Iraqi Ministry of Planning

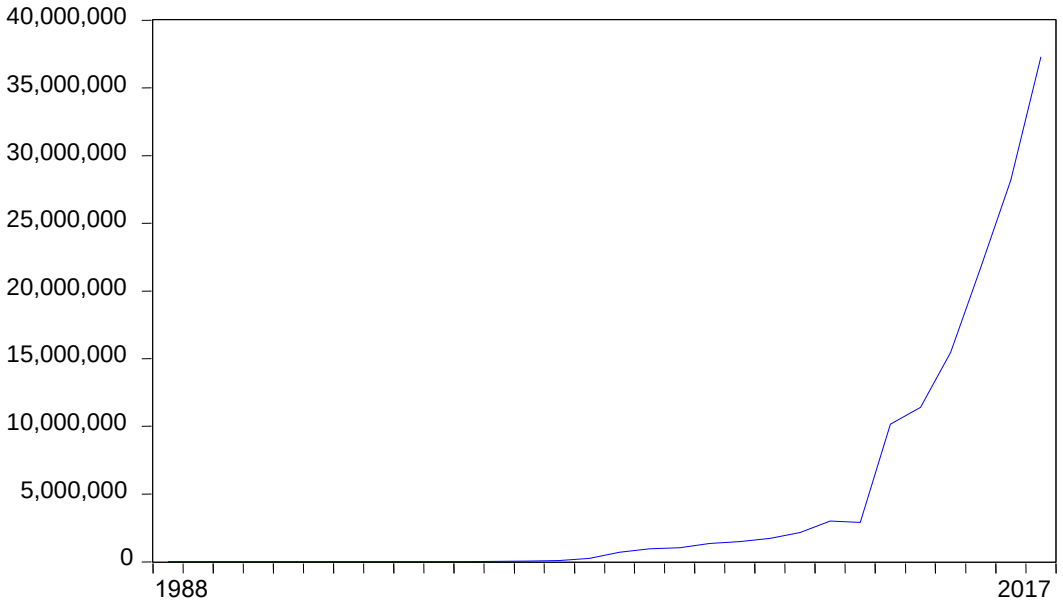
3.3- Test the correlation between the money supply and the general consumer price index

The data used in this letter are the data of the Central Bank of Iraq and the Central Bureau of Statistics. (A, b)
These data are annual data for the period from 1988 to 2017 and the researcher calculated the general index of consumer prices Basas 2003.
The studied variables are:
CPI: Consumer Price Index
M1: Money supply in the narrow sense.

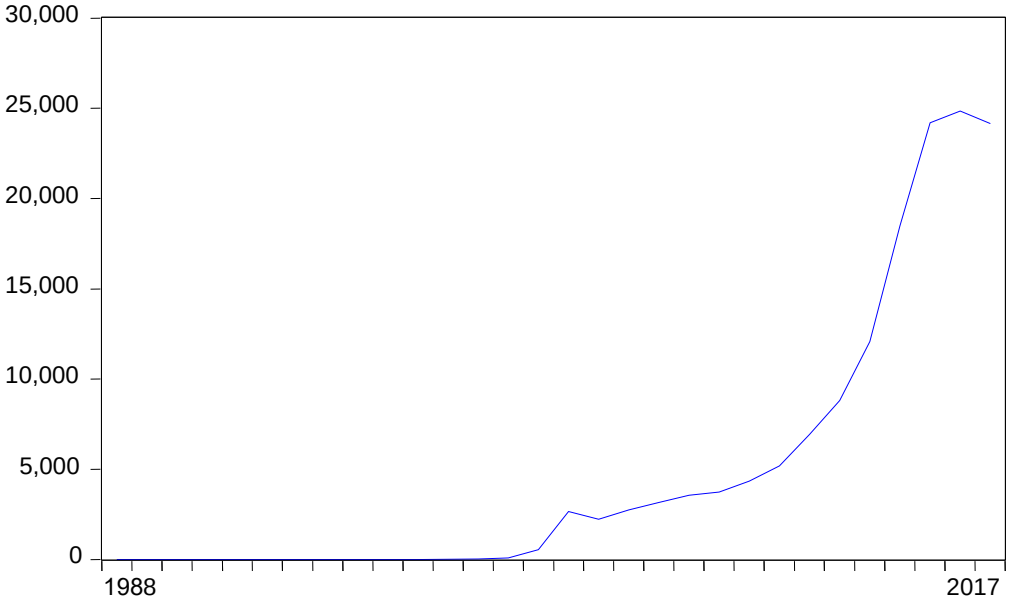
4.3 Estimation of the study model and standard results

1.4.3 Time series drawing
In order to analyze the time series, its observations are drawn to determine its general trend. The following two symbols represent the time series under study:

مجلة الغري للعلوم الاقتصادية والادارية
مجلد (21) عدد (2) 2025



Figer 1 MONEY SUPPLT M1



Figer 2
Consumer prices cpi

The coefficients of the self-correlation coefficients and the partial self-correlation of the two series were also more accurate, respectably

مجلة الغري للعلوم الاقتصادية والادارية
مجلد (21) عدد (2) 2025

Table 2
Correlogram of CPI

Date: 01/27/12 Time: 22:13
Sample: 1980 2009
Included observations: 30

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.861	0.861	24.553	0.000
		2	0.674	-0.262	40.126	0.000
		3	0.471	-0.150	48.007	0.000
		4	0.315	0.076	51.673	0.000
		5	0.218	0.073	53.505	0.000
		6	0.151	-0.056	54.412	0.000
		7	0.099	-0.036	54.817	0.000
		8	0.061	0.026	54.982	0.000
		9	0.028	-0.025	55.019	0.000
		10	-0.004	-0.042	55.019	0.000
		11	-0.038	-0.040	55.093	0.000
		12	-0.076	-0.038	55.399	0.000
		13	-0.117	-0.059	56.170	0.000
		14	-0.155	-0.039	57.612	0.000
		15	-0.196	-0.075	60.073	0.000
		16	-0.208	0.056	63.048	0.000

Table 3
Correlogram of M1

Date: 01/27/12 Time: 22:12
Sample: 1980 2009
Included observations: 30

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.736	0.736	17.946	0.000
		2	0.536	-0.014	27.786	0.000
		3	0.369	-0.046	32.619	0.000
		4	0.245	-0.015	34.842	0.000
		5	0.149	-0.025	35.699	0.000
		6	0.040	-0.103	35.764	0.000
		7	0.021	0.096	35.783	0.000
		8	-0.005	-0.031	35.784	0.000
		9	-0.024	-0.021	35.811	0.000
		10	-0.041	-0.017	35.893	0.000
		11	-0.058	-0.021	36.062	0.000
		12	-0.076	-0.047	36.366	0.000
		13	-0.091	-0.009	36.839	0.000
		14	-0.109	-0.040	37.551	0.001
		15	-0.125	-0.035	38.553	0.001
		16	-0.135	-0.024	39.803	0.001

The correlation coefficients (AC) are gradually decreasing until close to zero, while the PAC is interrupted at the first displacement and the probabilistic values are significant. This indicates that the time series is unstable and follows the self-regression model AR as well as the case table (3).

مجلة الغري للعلوم الاقتصادية والادارية
مجلد (21) عدد (2) 2025

2-4-3: Root unit test and stability

The unit root test is used to determine the degree of integration of the time series of the economic variables under study to determine whether the variables are stable or not. In this study, we will rely on the Extended Foley (ADF) test and the null hypothesis test H0: ρ = 1, Time series instability).

Table (2) shows the statistical results obtained from the application of the extended Dicky Fuller test at the level, the first differences and the second differences, and the critical values for each test at a significant level (5%).

Table 4
Results of unit root tests for economic variables

Difference 2			Difference 1			Level			variable
Withwout Constant and direction	Constant and direction	fixed	Withwout Constant and direction	Constant and direction	fixed	Withwout Constant and direction	Constant and direction	Only static	
-4.207 (1)*	-3.651 (2)*	-3.747 (2)*	-2.455 (1)	-3.705 (1)	-2.829 (1)	1.878 (2)	-2.2017 (1)	1.528 (2)	**CPI**
-1.115 (7)	-3.774 (7)*	-1.7044 (7)	2.444 (5)	1.298 (2)	2.094 (5)	4.645 (7)	4.162 (7)	4.474 (7)	**M1**

Stable at 5% according to McInnon 2006
(Akaike info Criterion) for a maximum of 7 periods.

It is clear from the previous table that the time series variables are unstable at their level and not in the first differences, but in contrast they are stable at the second differences and are integrated from the class I ~ (2) (with a constant limit and direction).

5-3: Analysis of joint integration

Now that the unit root test has been done for the variables studied and the variables are considered to be complementary to the second class I ~ (2), we turn to the topic of joint integration and the basis of the method of joint integration as mentioned above. (They have a long-term equilibrium relationship) if in one slope over the other the survival itself is stable.5:

1-5-3: Test the equation of joint integration using the Angel - Granger method

After checking the first condition, which assumes the integration of time series of the same class, integration is tested. Combined integration between the general

مجلة الغري للعلوم الاقتصادية والادارية
مجلد (21) عدد (2) 2025

index of consumer prices and the presentation of cash using the Angel-Granger method. The regression coefficient of joint integration is estimated by using the standard lower squares method, - Fuller .

Table 5
Unit root test of the residue chain to check for cointegration

WITHOUT STATIC OR DIRECTION	CONSTANT AND DIRECTION	FIXED ONLY	TIME SERIES
-0.6117(5)	-3.705* (1)	-2.829 (1)	SERIES ERRORS
-1.6087	-3.2292	-2.6274	TABLE VALUE AT SIGNIFICIENT LEVEL OF 10%

* Stable at 5% according to McInn (2006)
(Akaike info Criterion) for a maximum of 7 periods.

It is clear from the previous table that the series of errors is stable at level I ~ (0) with a constant limit and a time trend

2-5-3: Test the equation of co - integration using the Johansen method

We detect the long-term relationship using the Johansen test, which gives us the value of trace under the following assumptions:
The first hypothesis is: H0: q = 0
The second hypothesis is: H1: q> 0
Where the null hypothesis is rejected in favor of the alternative hypothesis, if the calculated trace values are greater than

Table 6
Results of the Johansen cointegration test according to the effect statistics

Prob	*trace*	Critical value% 5	Null hyp
0.0002	29.5732	15.49671	q=0
0.4626	0.539496	3.841466	q>0

In the previous table, trace is less than the critical value of 5%. Thus, we accept the null hypothesis that there is at least one vector of cointegration, indicating a stable linear combination between economic variables (CPI, cash supply).
This result also confirms the existence of a long-term equilibrium relationship between the variables, which means that they do not diverge from each other as they show relatively similar behavior.

3-5-3: Estimation of the regression equation of joint integration

After checking the existence of a common integration relationship between the general index of consumer prices and the presentation of cash, the regression equation of joint integration was estimated according to the estimation methods referred to above. The results of EVIEWS.7 were shown as follows:

مجلة الغري للعلوم الاقتصادية والادارية
مجلد (21) عدد (2) 2025

Table7
Estimating the parameters of the long-term cointegration relationship using different estimation models

	R^2	$\hat{\beta}_0$	$\hat{\beta}_1$	Std.Error of $\hat{\beta}_0$	Std.Error of $\hat{\beta}_1$	t-Stat of $\hat{\beta}_1$	t-Stat of $\hat{\beta}_0$	S^2	F
OLS	0.9154	1176.6	0.000805	474.484	4.62E-05	2.479	17.409	1.5E+08	303.08
FMOLS	0.9115	1011.2	0.000777	575.361	5.51E-05	1.757	14.091	1.55E+08	198.58
DOLS	0.968	827.361	0.00096	386.888	0.000263	2.138	3.642	43182686	24.608
CCR	0.891	1154.189	0.000693	564.256	9.66E-05	2.045	7.1709	1.9E+08	24.608

From the previous table you can see the following:
1 - the method of the lower squares usual OLS:
CPI = 1176.6 + 0.00805 M1
R^2 = 0.91543, F-statistic = 303.0841
_ Through the equation of joint integration can be observed positive relationship between the variable money supply and the general index of consumer prices during the period investigated in 1980-2009, since the presentation of cash M1 and as shown in
The previous model has a clear role in influencing the general index of consumer prices. The more money supply is increased by one unit, the higher the general index of consumer prices by 0.00805.
The value of the reference factor is 0.91543, which means that the independent variable M1 money supply affects the CPI variable by 91% and the remaining 9% is due to variables and other factors that are not included in the model, or can be included in random variable.
The value of calculated F is 303.0841 when compared with the value of F (0.05.1,28) = 4.20
Note that the calculated value is greater than the tabular value. This indicates the significance of the estimated model as a whole and the significance of the determinant factor.
2-Modified FMOLS:
CPI = 1011.235 + 0.000777M1
R^2 = 0.91156, F-statistic = 198.5825
The correlation between the money supply variable and the general consumer price index during the period investigated 1988-2017 can be observed. The M1 money

مجلة الغري للعلوم الاقتصادية والادارية
مجلد (21) عدد (2) 2025

supply, as shown in the previous model, has a clear effect on the CPI. One increases the consumer price index by 0.000777.

The value of the reference factor is 0.91156, which means that the independent variable M1 money supply affects the dependent variable (CPI) by 91% and the remaining 9% is due to variables and other factors not included in the model, or can be included in random variable.

The calculated F value was 198.5825 and when compared with the value of F (0.05,1,27) = 4.21

Note that the calculated value is greater than the tabular value. This indicates the significance of the estimated model as a whole and the significance of the determinant factor.

3- Dynamic DOLS:

CPI = 1232.745 + 0.000823M1

R^2 = 0.915142, F-statistic = 24.60889

The correlation between the money supply variable and the general consumer price index during the period investigated 1988-2017 can be observed. The M1 money supply, as shown in the previous model, has a clear effect on the CPI. One increases the consumer price index by 0.000823.

The value of the reference factor is 0.915142, which means that the independent variable M1 money supply affects the dependent variable (CPI) by 91% and the remaining 9% is due to variables and other factors not included in the model, or can be included in random variable variable.

The value of calculated F is 24,60889 and when compared with the value of F (0.05,1,26) = 4.2252 we note that the calculated value is greater than the tabular value. This indicates the significance of the estimated model as a whole and the significance of the determining factor.

4-way regression common legal integration CCR:

CPI = 1154.189 + 0.000693 M1

R^2 = 0.891236, F-statistic = 51.42197

The correlation between the money supply variable and the general consumer price index during the period investigated 1988-2017 can be observed. The M1 money supply, as shown in the previous model, has a clear effect on the CPI. One increases the consumer price index by 0.000693.

The value of the coefficient of 0.891236, which means that the independent variable M1 money supply affects the dependent variable (CPI) by 89% and the remaining 11% is due to variables and other factors not included in the model, or can be included in random variable Random Variable.

(F) (0.05,1,27) = 4.21 Note that the calculated value is greater than the tabular value, indicating the significance of the estimated model as a whole and the significance of the coefficient of selection.

مجلة الغري للعلوم الاقتصادية والادارية
مجلد (21) عدد (2) 2025

Conclusions

1- The relationship between the general index of consumer prices and the presentation of money in terms of narrowness is positive and statistically weak. This means that cash is important in determining the general index of consumer prices. This can be explained by the increase in the quantity of traded cash will increase spending on the purchase of various goods and services, In order to meet this demand, the high amount of cash in circulation has led to the revitalization of the Iraqi economy.

2 - The relationship between GDP and money supply in terms of narrowness positive and statistical significance, which means that money supply is an important element in the economy of Japan

3. The short-term and long-term relationship was illustrated by the adoption of the regression model of joint integration and the error correction model for the research phenomena: the general index of consumer prices and cash supply in Iraq and between GDP and cash supply in Japan.

Recommendations

1 - Recommends the researcher to direct future research efforts towards the impact of the presentation of cash in other macroeconomic variables in the same sample of countries studied and different times of time as well as study the same variables in other countries.

2 - Conduct more statistical research in the estimation of the equation of the regression of joint integration in the short and long term. References

Foreign sources

1-Afaf Abdul Jabbar Saed(2004), "Estimation of Total Energy Consumption in Jordan (1980-1999): Evidence from Cointegration and Stock " , Journal of Economic and Administrative sciences,Vol.20,No.1,June 2004(71-82)

2- Agbola,W.Frank and West ,L.Kristin (2005), "Causality Links between Asset Prices and Cash rate in Australia ", Inter National Journal of Applied Econometrics and Quatitative studies, Vol.2-3.

3- Allan W.Gregory and Bruce E.hansen, " Residual – Based tests for Cointegration in Models with Regime shifts ", Journal of Econometrics 70(1996) 99-126.

4-Anindy Banerjee , Juan Dolado , John W.Galbraith , David F.Hendy, " Co-Integration , Error_ Correction , And Econometric Analysis of Non _ Stationary Dtata ", Advanced Texts in Econometrics.

5- Augustine c.Arize(1994) , " Cointegration Test of A long_Run Relation between The Real Effective Exchange rate and The Trade Balance ", Inter National Economic Journal,Vol 8, No.3.

6- Aysu Insel , " Time Series Analysis and Econometric Modelling " , Econometrics , lecture 5 .

29-Badi H.Baltagi, " A Companion to Theoretical Econometrics"

مجلة الغري للعلوم الاقتصادية والادارية

مجلد (21) عدد (2) 2025

, Blackwell companions to contemporary Economics.
7-Bent E.Sqrensen (2005), " Cointegration ",Economics 266,Spring.
8-Bernhard Dfaff(2008), " Analysis of Integrated and Cointegrated Time Series ", Germany
9-Brojol Sutijo, " Cointegration Approch on Estimation Model of Export and Import Agricultural Product " , proceeding of llCMA 2009.
10- Box G,E.P and Jenkins G.M(1976), "Time series Analysis Forcasting and Control Sanfrancisco Helen-day ".
11- Box, G.E and Tio(1979), " Distribution of Residual Autocorrelation in Multiple Autoregressive ", JASA,Vol.(74),pp.(928-934).
12- Burce E.Hansen, " Efficient Estimation and Testing of cointegrating vectors in The Presence of deterministic trends ", Journal of Econometrics 53(1992) 87-121.North-Holland.
13- Carol Alexander and John Wyeth, " Seasonal Price Movement and Unit Roots in Indonesian rice market Integration".
14- Charles S.Wassell, JR and Peter J.Sannders, " Time Series Evidence on Social Security and Private saving: The Issue Revisited " .
15-Chatfield,c(1975), " The Analysis of Time Series ",Second Edition Chapman and Hall London-Newyork.
16-Chi- Young Choi , Ling Hu , Masao Ogaki(2004), "Structural Spurious Regression and A hanusman- wu Type Cointegration Test ".